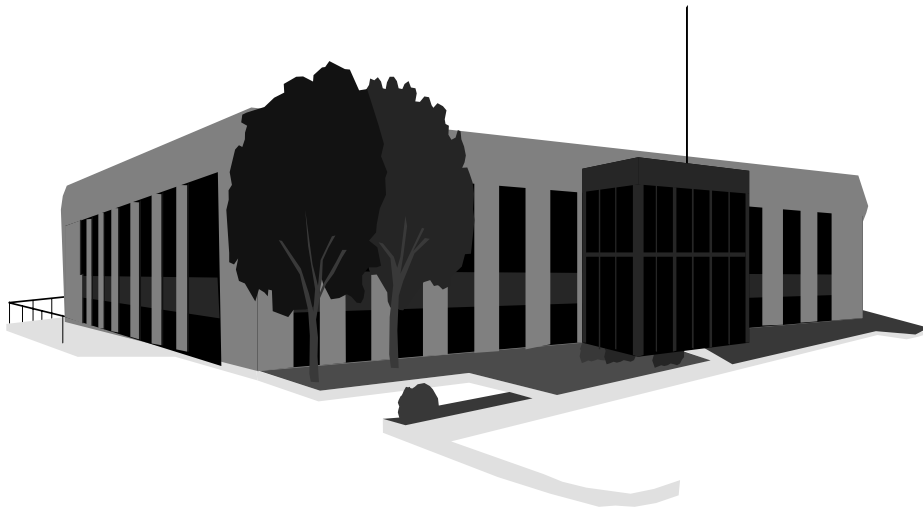


INDOOR AIR QUALITY ASSESSMENT

**Jones Library
43 Amity Street
Amherst, Massachusetts**



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
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Background/Introduction

At the request of Bonnie Isman, Chief Librarian at the Jones Public Library, the Bureau of Environmental Health Assessment (BEHA) of the Massachusetts Department of Public Health (MDPH) provided assistance and consultation regarding conditions within the basement crafts room in the Jones Library, Amity Street, Amherst, Massachusetts. This request was prompted by reports of water damage to the south wall of the craft room.

On December 7, 2000, a visit was made to the library by Michael Feeney, Chief of Emergency Response/Indoor Air Quality (ER/IAQ), BEHA, to conduct an indoor air quality assessment. Ms. Isman accompanied Mr. Feeney during the assessment. The Jones Library is a multi-story building that consists of a number of additions (see Picture 1). During construction of the additions, a mechanical heating, ventilating and air-conditioning (HVAC) system was installed. The craft room west wall has one window that opens into a stone-lined pit (see Picture 2). The south wall is located below grade beneath a garden in the front of the building.

As reported by Ms. Isman, the crafts room was used by a group that routinely opened windows during the summer when the HVAC system was operating in its cooling setting. During this time, water damage to the south wall of the room was noted. A consultant was hired to assess the crafts room. This consultant recommended that the crafts room window be closed during the cooling season (WSSI, 2000). To control condensation a choice of 1) increasing the room temperature, 2) activating the exhaust fan or 3) using a dehumidifier in this room to maintain relative humidity below 60 percent during the summer should be implemented.

Methods

Water content of the gypsum wallboard (GW), wall plaster and baseboard was measured with a Delmhorst, BD-2000 Model, Moisture Detector using a Delmhorst Standard Probe. Temperature and relative humidity were taken with the TSI, Q-Trak TM, IAQ Monitor Model 8551.

Results/Discussion

Standard indoor air quality evaluation procedures could not be employed to evaluate indoor air quality with the room unoccupied. The HVAC system in the crafts room consists of a single fresh air supply diffuser connected to a basement air-handling unit (AHU) by ductwork. No return vent to the AHU exists in this room. A window mounted exhaust fan is installed in one window in the crafts room, which was deactivated during the assessment.

Concerns about the possible presence of microbial growth in building components (wall plaster, GW, and pipe insulation) were raised. In order for building materials to support mold growth, a source of water exposure is necessary. Identification and elimination of water moistened building materials is necessary to control mold growth. Identification of building components with increased moisture content over normal concentrations may indicate the possible presence of mold growth. Identifying the location of building components with increased moisture levels can also provide clues concerning the source of water supporting mold growth.

During the normal operation of the HVAC system, moisture is introduced into a building during weather with high relative humidity. As relative humidity levels increase indoors, porous building materials, such a plaster, can absorb moisture. This moisture content in building components can fluctuate with increases/decreases in indoor relative humidity. In order to prevent moisture from building up, exhaust ventilation to create air

movement is used. Occupants reported that the window-mounted exhaust fan is not generally used because of noise. When activated, the speed of the fan blade rotation creates loud noise, rendering crafts difficult. The motor speed cannot be reduced, since the wall switch only activates or deactivates the fan. If the speed of this fan can be adjusted, exhaust ventilation may be maintained while reducing noise. With operating exhaust ventilation, moisture introduced into the crafts room can be ejected by this exhaust fan, subsequently reducing indoor relative humidity.

In an effort to ascertain moisture content of plaster, GW and pipe insulation, moisture samples were taken in the crafts room and adjacent areas. A Delmhorst probe was inserted into the surface of building components (see Picture 3). The Delmhorst probe is set to sound a signal when a moisture reading ≥ 0.5 percent in GW and 60 percent in plaster is detected. The building was evaluated in the afternoon on a sunny day, with an outdoor temperature of $< 32^{\circ}\text{F}$ and relative humidity of 23 percent. No active leaks were observed and no visible, accumulated moisture was noted on walls.

A number of moisture samples were taken throughout the crafts room. Moisture content of plaster and GW within the normal range (1.1 to 43.4 percent) was measured in the south wall. The variance in measured moisture concentration in different sections of plaster of the same wall may indicate some moisture exposure. The highest moisture concentration was measured in a wall crack of the south wall (see Picture 4). Please note that moisture content of GW measured is a real time measurement of the conditions present in this building on December 7, 2000. Moisture content may increase or decrease depending on building and weather conditions.

Moisture sources in the indoor environment can originate from several sources. While introduction by the HVAC system may occur, the most likely source of moisture appears to be water penetration through the foundation. Located above the craft room south

wall is a peaked roof (see Picture 5). A gutter and drain system exists above the south wall. The gutter appears to be bent into a shape that allows for rainwater to splash over the gutter into the soil above the south wall (see Picture 6). This condition allows for rainwater to accumulate along the base of the building, which can, in turn seep below ground along the foundation.

Efflorescence (i.e., mineral deposits) was observed on the brickwork on the interior of the south wall in several places (see Picture 7). Efflorescence is a characteristic sign of water intrusion. As moisture penetrates and works its way through mortar around brick it leaves behind these characteristic mineral deposits. Efflorescence on carpeting indicates that these materials are chronically wetted. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials be dried with fans and heating within 24 hours of becoming wet (ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Once mold growth has occurred, disinfection of may be possible, however these materials are porous and appear to be wetted repeatedly, disinfection is likely to be ineffective.

Conclusions/Recommendations

In view of the findings at the time of our inspection, the following recommendations are made:

1. Continue with plans to repair the gutter. Provide adequate drainage to direct water away from the foundation.
2. Consider having exterior brick repointed and waterproofed to prevent further water intrusion. Repair/replace water damaged carpeting and wall-plaster as necessary.
3. The window in the crafts room should remain closed when the HVAC system is providing cooling during summer weather.

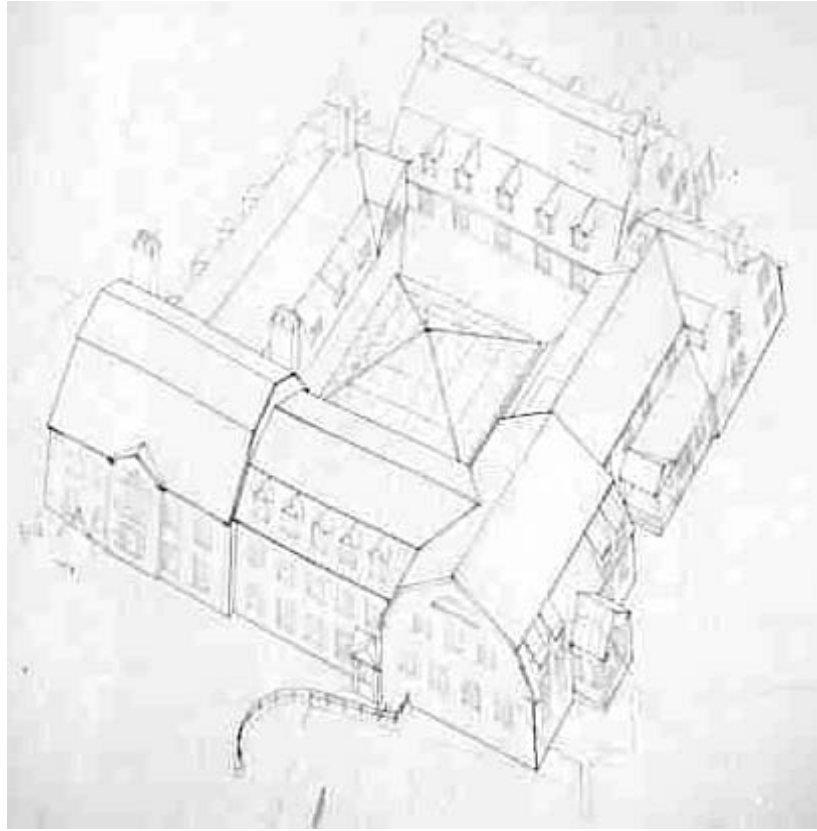
4. Examine the feasibility of installing a speed control switch in place of the current wall switch so the speed of the exhaust fan blades can be adjusted (see Picture 8 for an example). Examine the louvers behind this fan for function and repair as needed.
5. Operate the exhaust fan during summer months. In addition to a speed control, examine the feasibility of installing a timer to activate the exhaust fan during business hours.

References

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

WSSI. 2000. Letter to John Imbilbo, Maintenance Supervisor, Jones Library from Stephen Smulski, President, WSSI concerning wall water damage at the Jones Library, dated October 16, 2000. Wood Science Specialists, Inc. Shutesbury, MA.

Picture 1



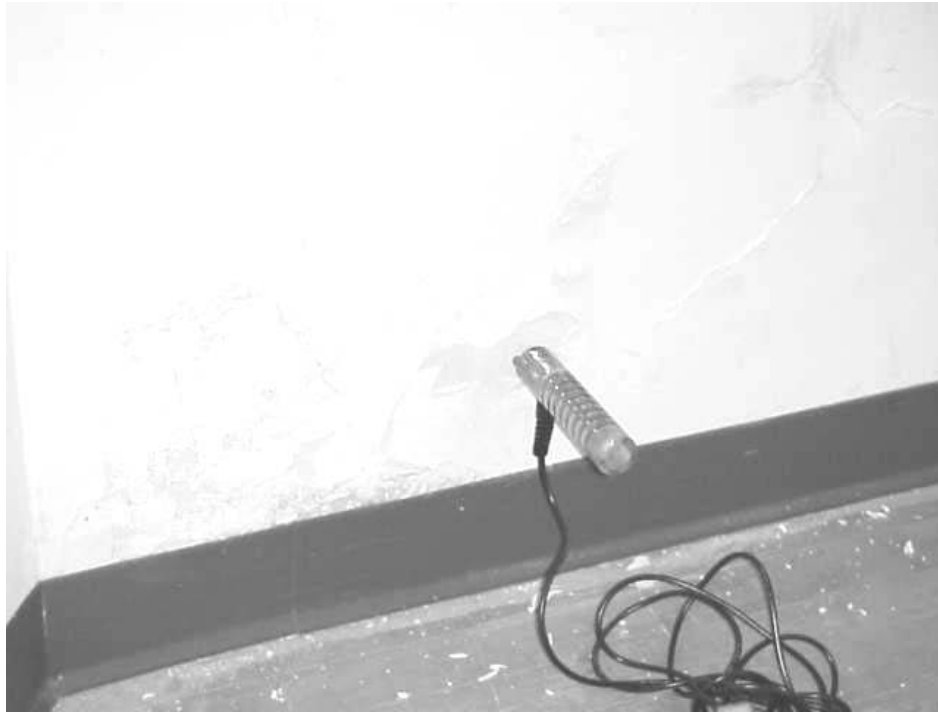
Blue Print Rendering of the Jones Library

Picture 2



Craft Room Window That Opens into A Stone-Lined Pit

Picture 3



A Delmhorst Probe was inserted into the South Wall of the Crafts Room

Picture 4



Wall Crack of the South Wall with Highest Moisture Concentration (43.4 Percent)

Picture 5



Edge of Roof Over Ground above the Craft Room South Wall

Picture 6



Bent Gutter over South Wall, Note Bent Gutter Fasteners

Picture 7



Efflorescence in South Wall Plaster

Picture 8



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Example of Variable-Speed Fan Control Switch

Table 1
Jones Library, Amherst MA-December 7, 2000
Building Component Moisture Content Sampling Results

Area	Material Sampled	Temperature (° F)	Relative Humidity (%)	Moisture Concentration (%)
Outdoors		< 32	27	-
Crafts Room	Plaster Center Wall	68	19	1.1
Crafts Room	Plaster Center Wall through Baseboard	68	19	2.1
Crafts Room	Plaster Center Wall, 4' Above Floor Through Crack	68	19	43.4
Crafts Room	Plaster, Alcove Ceiling	68	19	9.3
Crafts Room	Plaster, Left Alcove Wall, 3' above Floor	73	60	1.6
Crafts Room	Plaster, Left Alcove Wall, 5' above Floor	73	56	12.3
Crafts Room	Plaster, Right Alcove Wall, 3' above Floor	73	68	25.2
Crafts Room	GW, Interior Wall By Hallway Door, 5' above Floor	73	58	Non-Detectable
Crafts Room	Plaster, South East Wall, Near Floor Level	73	69	1.1
Crafts Room	Plaster, South East Wall, 4' Above Floor	73	57	Non-Detectable
Crafts Room	Pipe Insulation			Non-Detectable
Hallway outside Crafts Room	GW, 5' Above Floor	73	58	Non-Detectable
Ground Floor Stack Room	GW, 5' Above Floor	73	58	Non-Detectable